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(54) **LIGHT FIXTURE SUPPORT SYSTEM**

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(73) Assignee: **Ruud Lighting, Inc.**, Racine, WI (US)

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***B60Q 1/00*** (2006.01)

(52) **U.S. Cl.** ..... **362/368**; 362/365; 362/147

(58) **Field of Classification Search** ..... 362/147, 362/148, 150, 365, 370, 372, 373; 248/342
See application file for complete search history.

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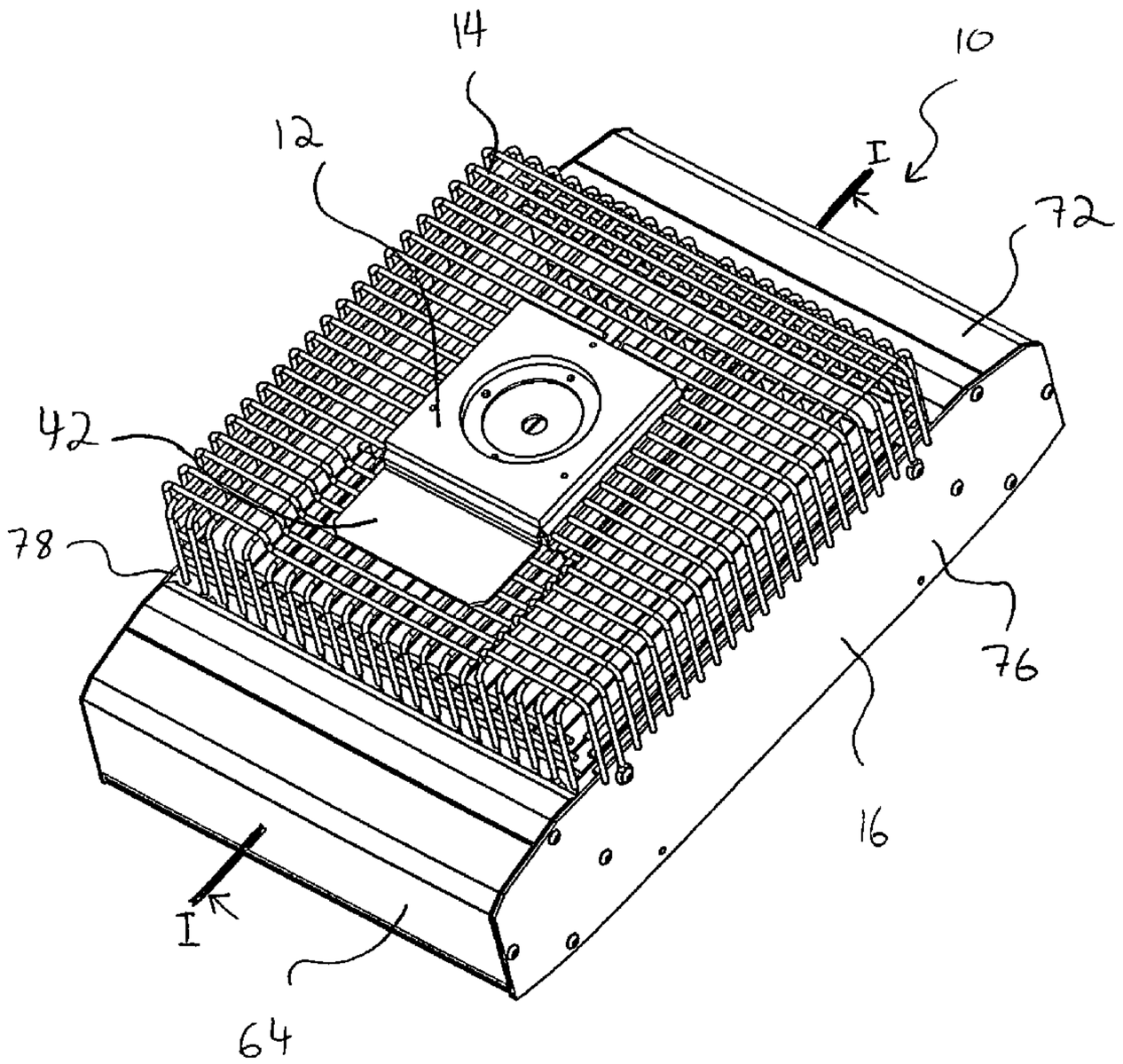
(57) **ABSTRACT**

The inventive ceiling-mounted light-fixture support assembly includes a mounting bracket having upper and lower surfaces, a length, and a width between two width sides. The assembly also includes a fixture attachment member having a top with portions defining a top opening which has a width narrower than the width of the mounting bracket. The fixture attachment member further has a recessed portion defining a slideway which (a) is in lateral communication with the top opening, (b) has a width wider than the width of the mounting bracket, and (c) is spaced sufficiently lower than the opening-defining portions of the top to receive the two width sides of the mounting bracket. In use, the fixture attachment member can be positioned so that the mounting bracket is at least partially within the slideway and then repositioned so that the mounting bracket is within the top opening for light-fixture support.

**15 Claims, 11 Drawing Sheets**



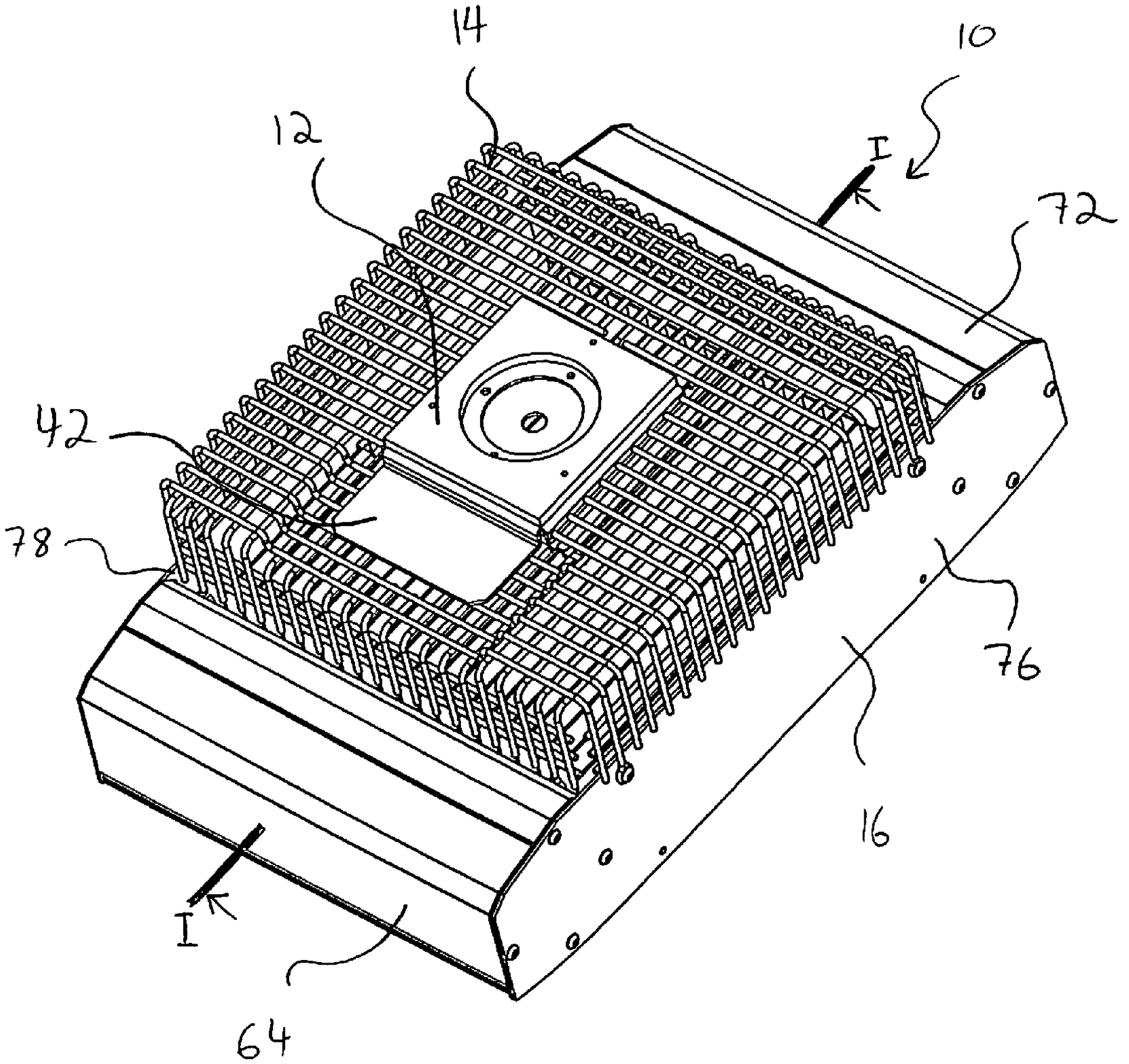



FIG. 1

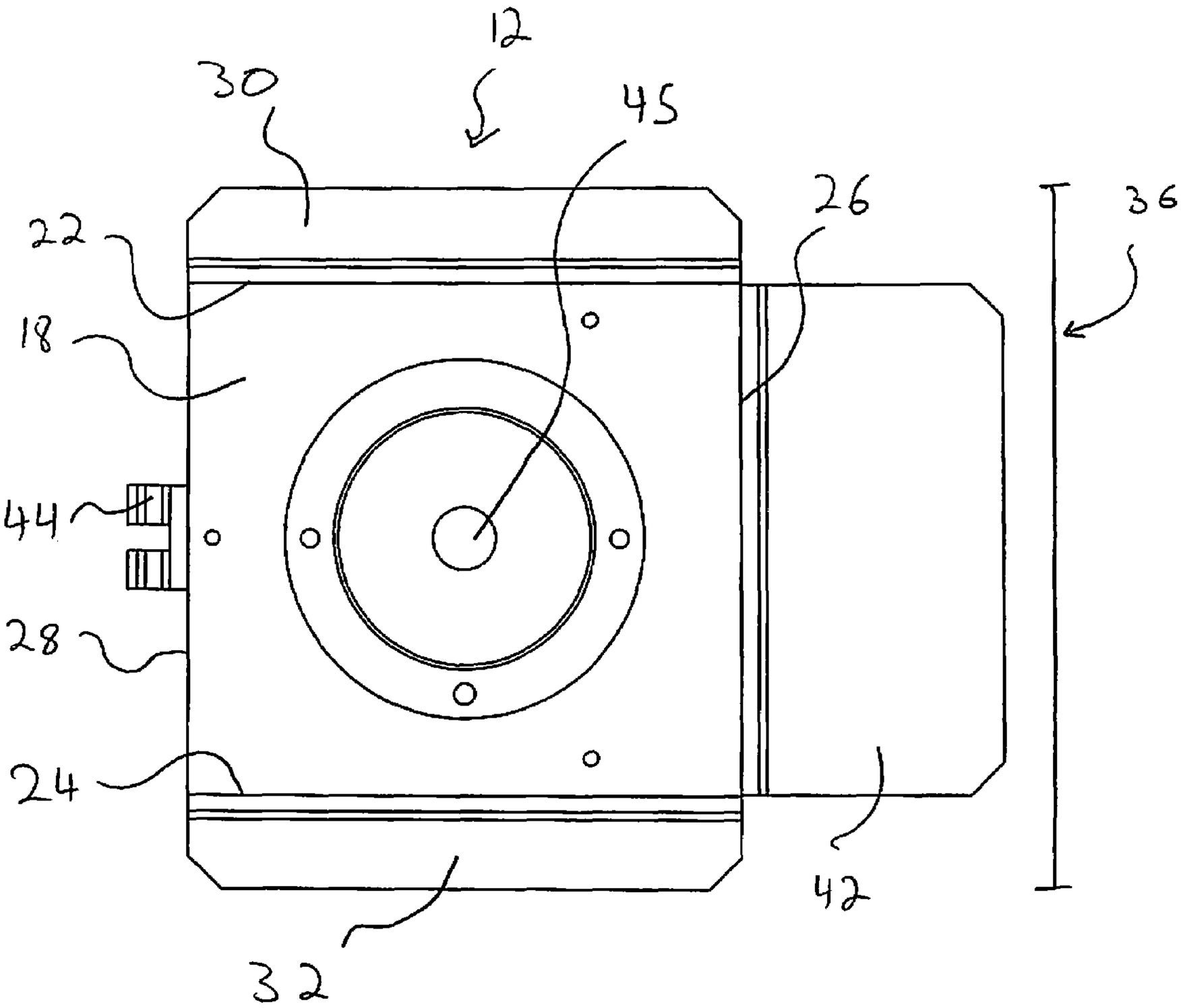



FIG. 2

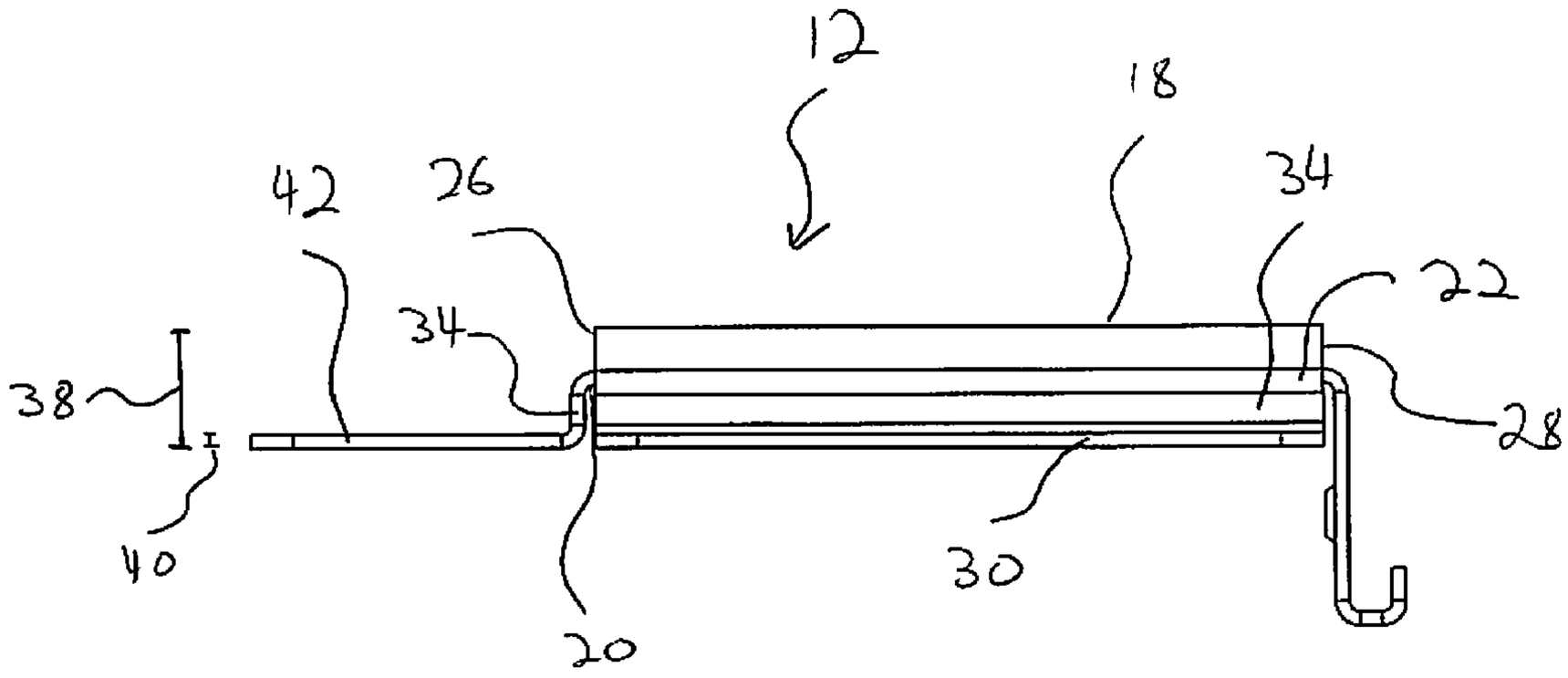



FIG. 3

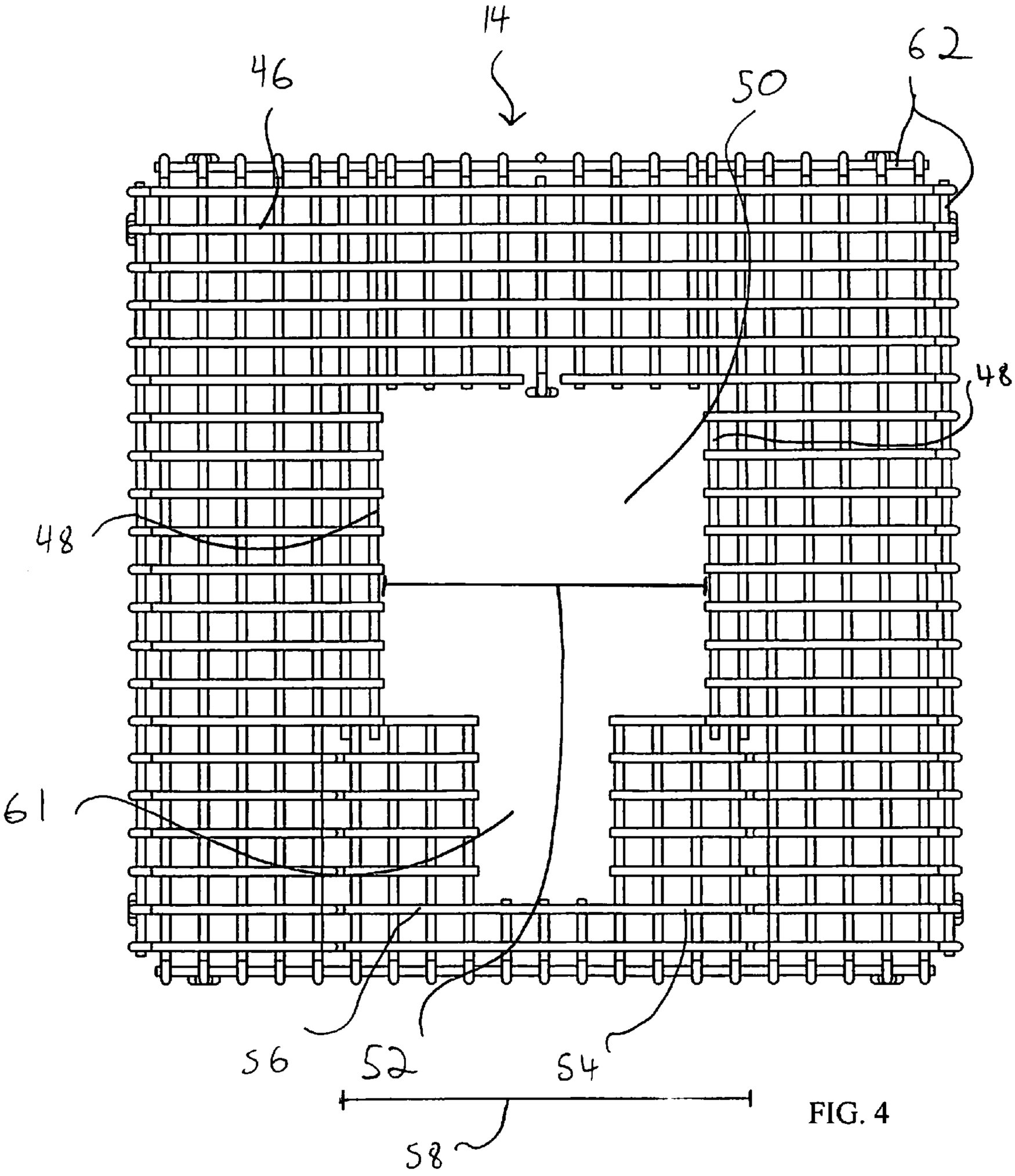



FIG. 4

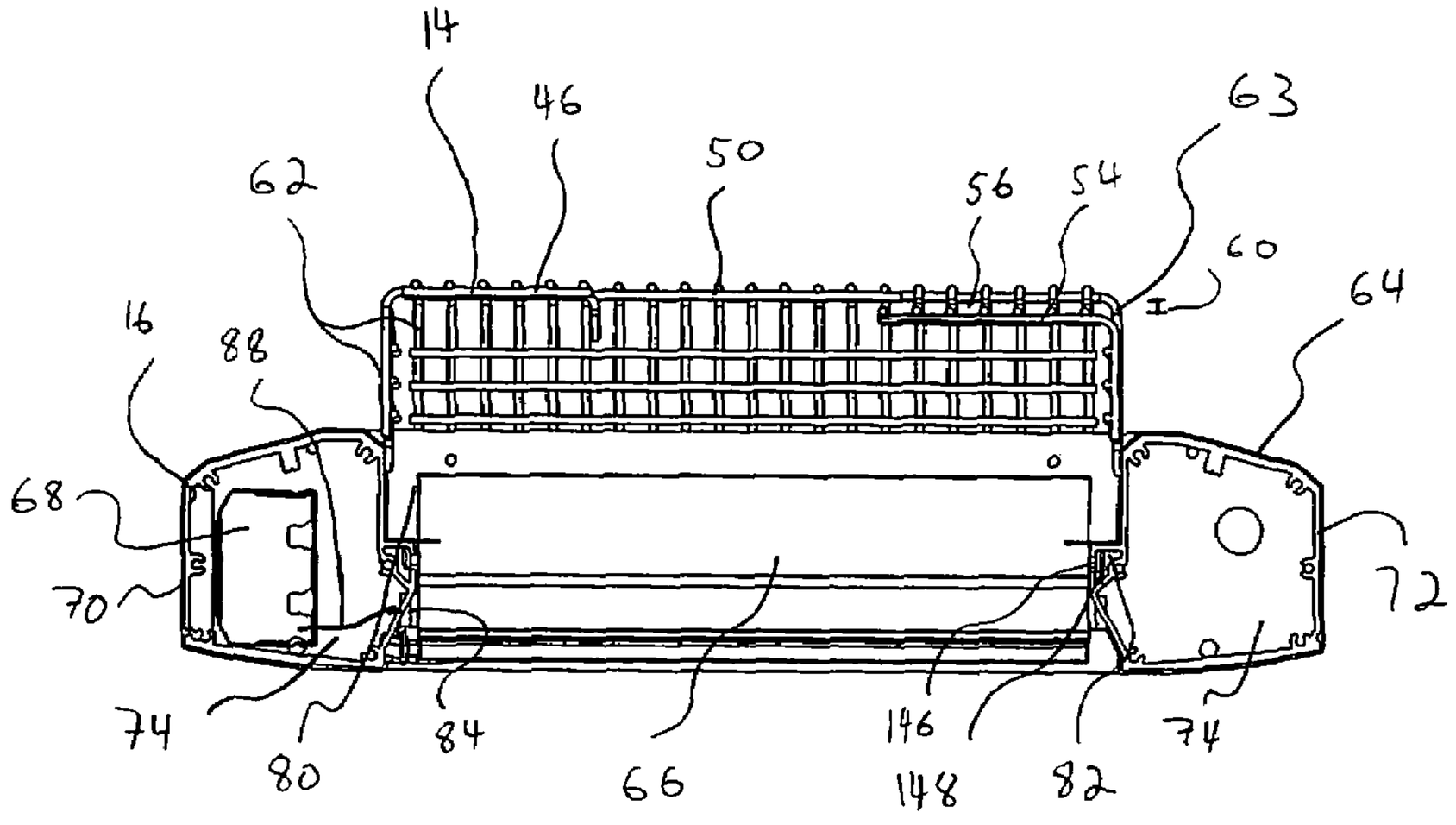



FIG. 5

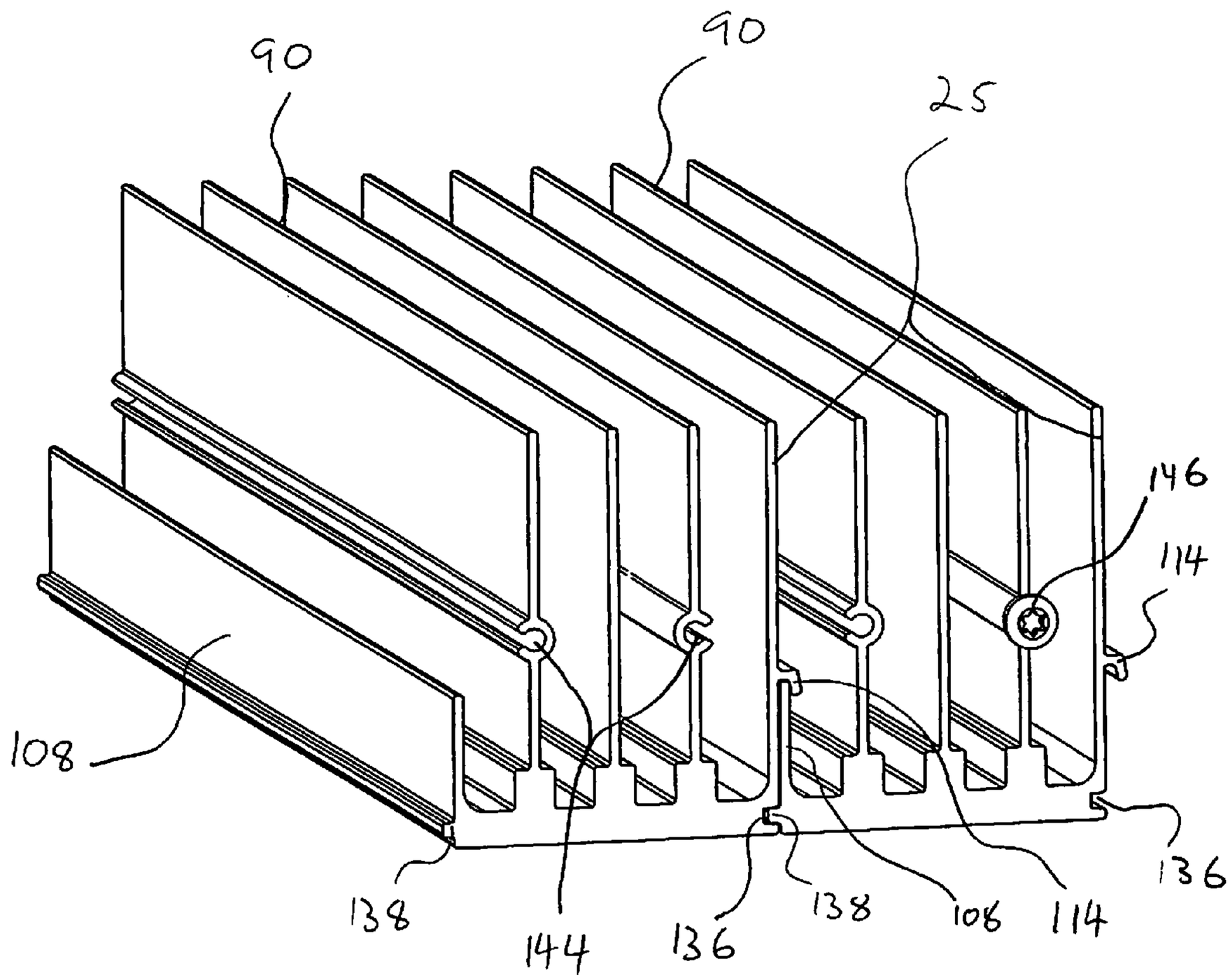



FIG. 6

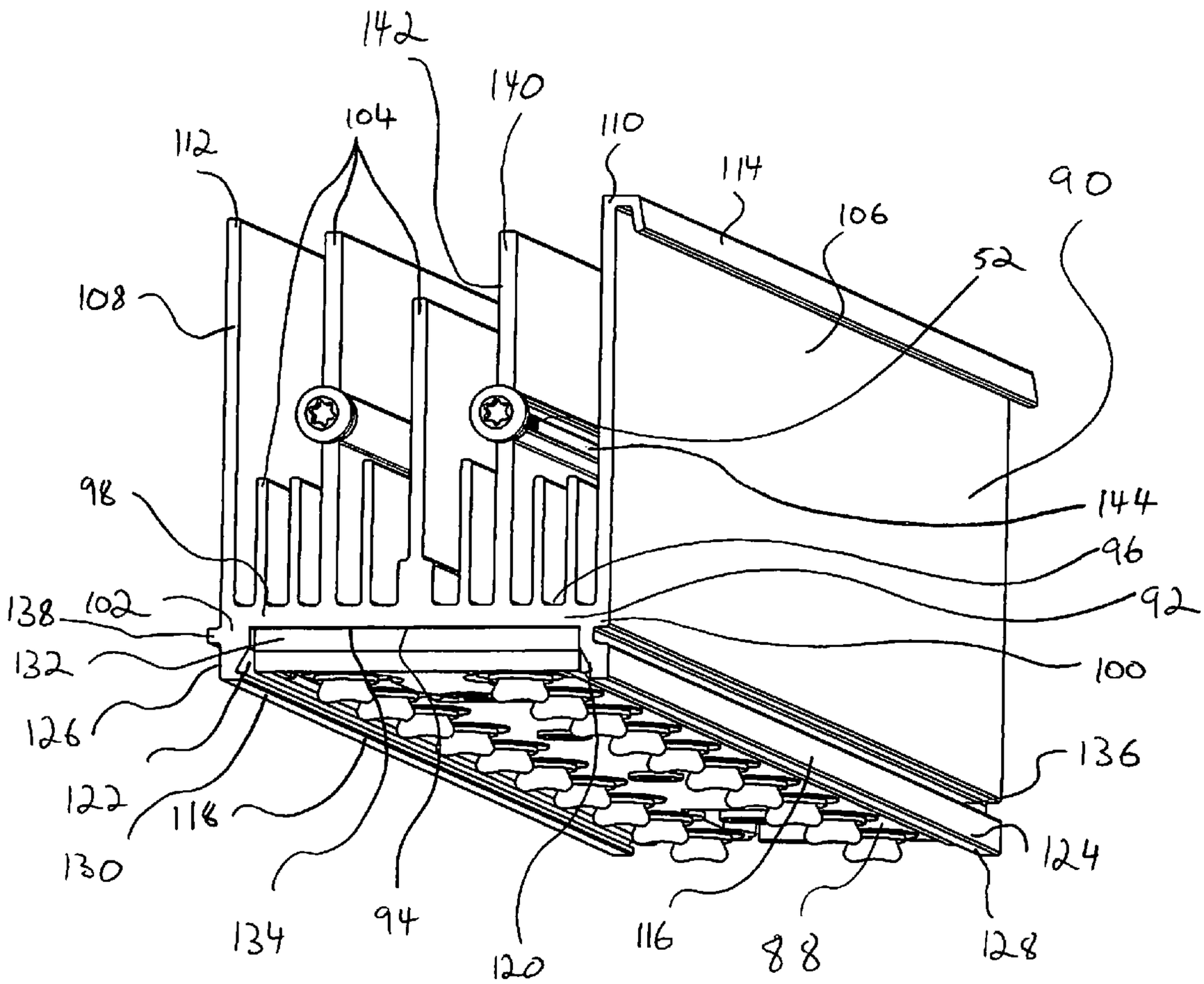

142
140
104
112
110
114
106
90
52
108
98
144
96
92
138
102
132
100
126
136
122
116
124
130
134
94
120
116
88
128

FIG. 7

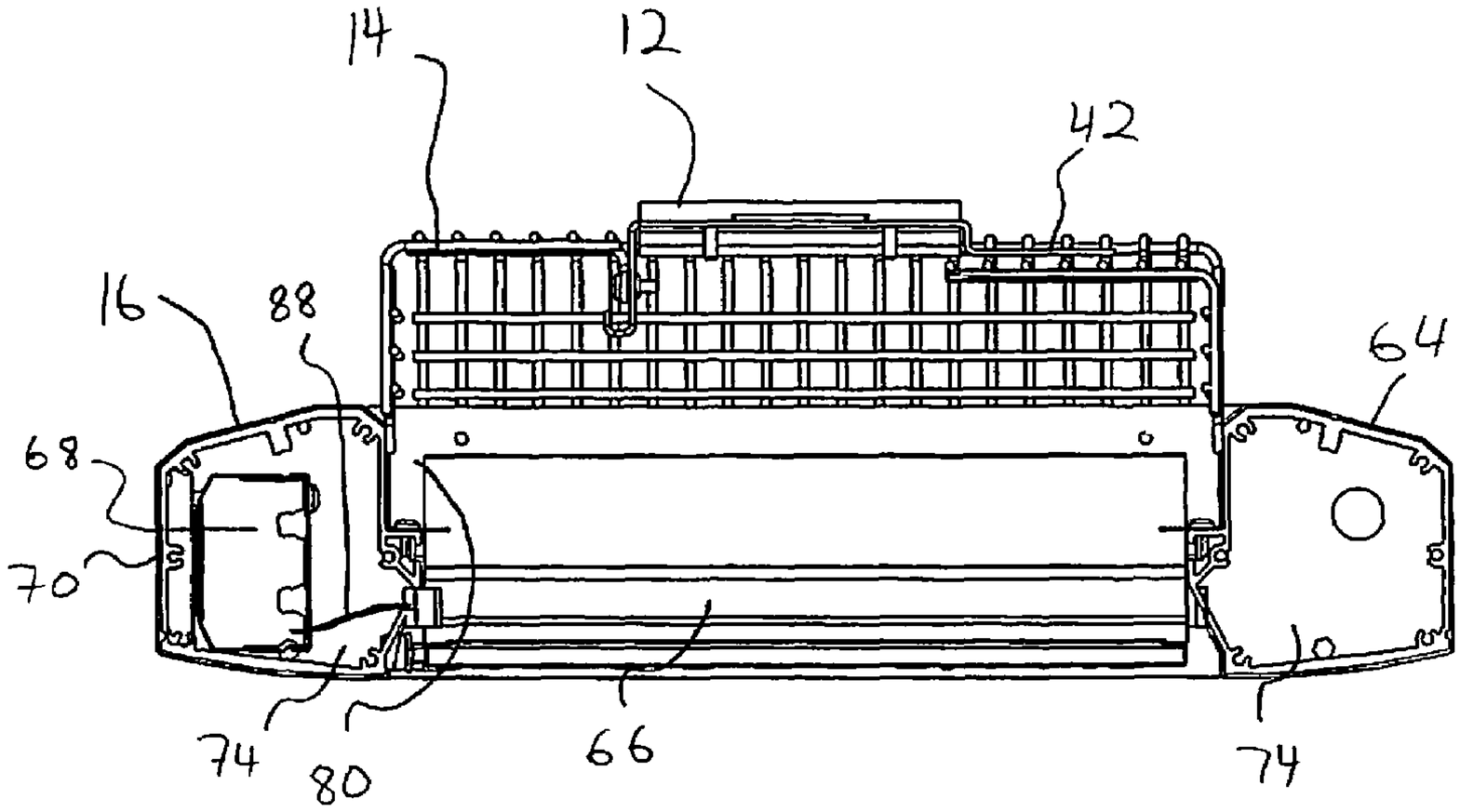



FIG. 8

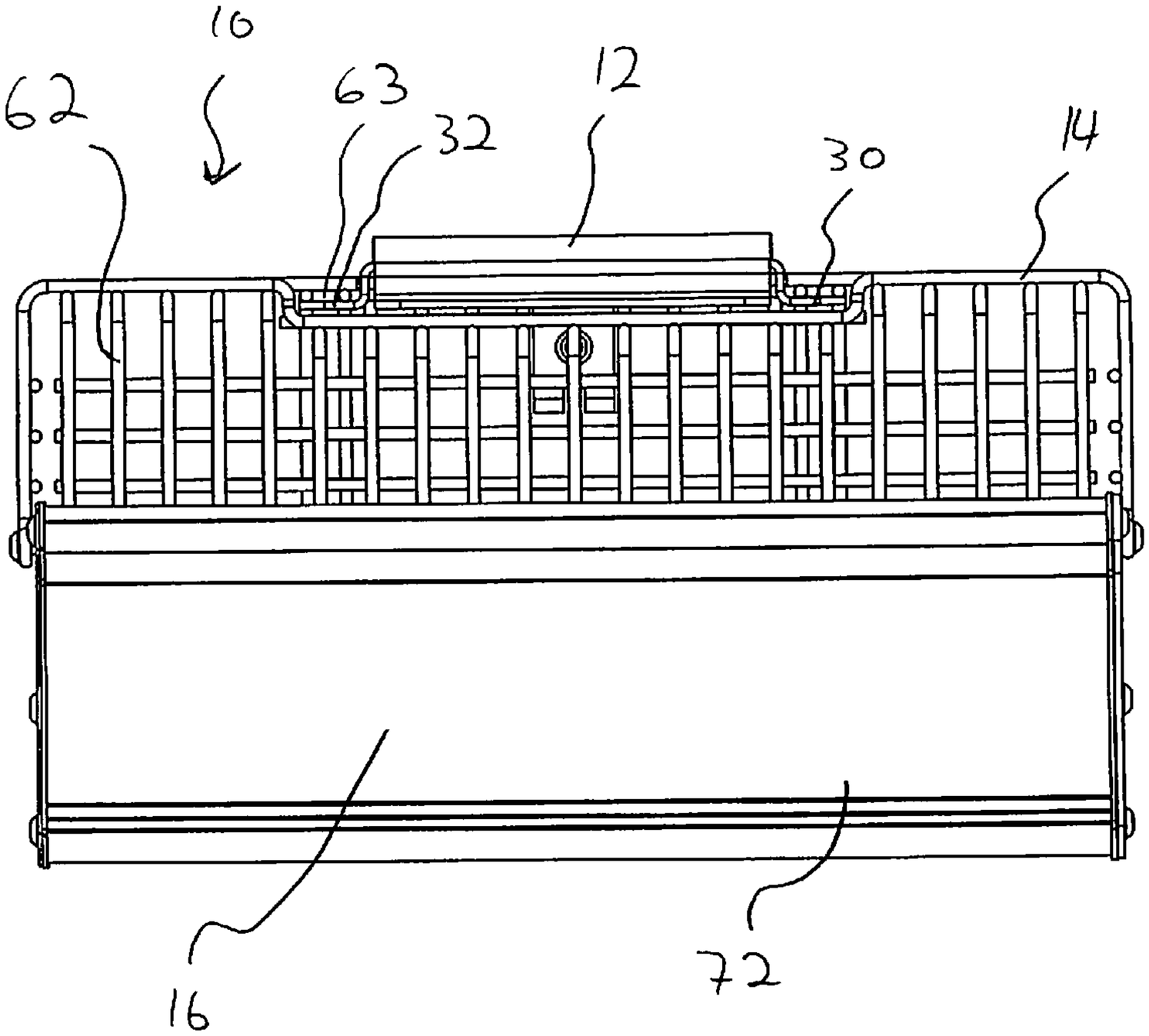



FIG. 9

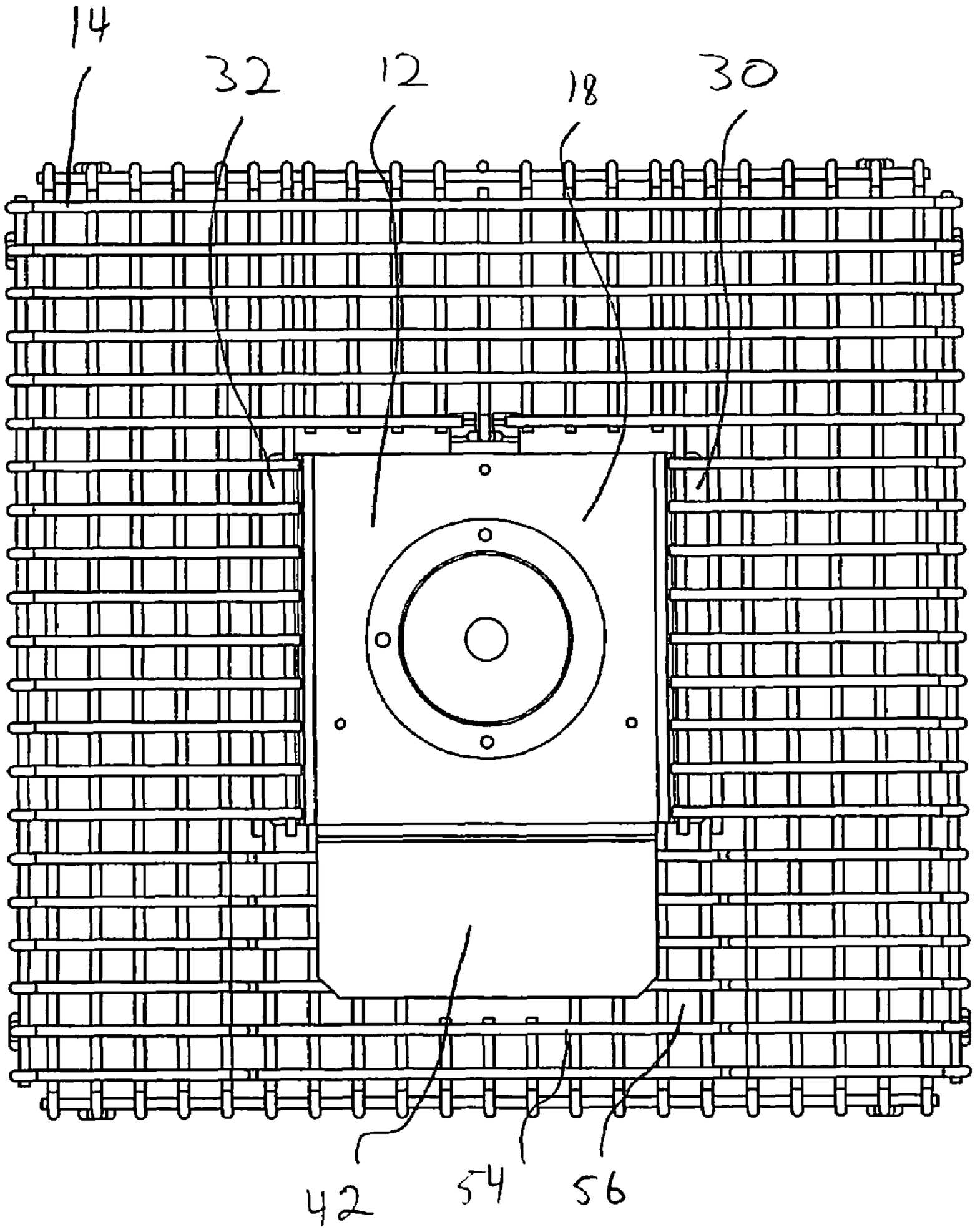



FIG. 10

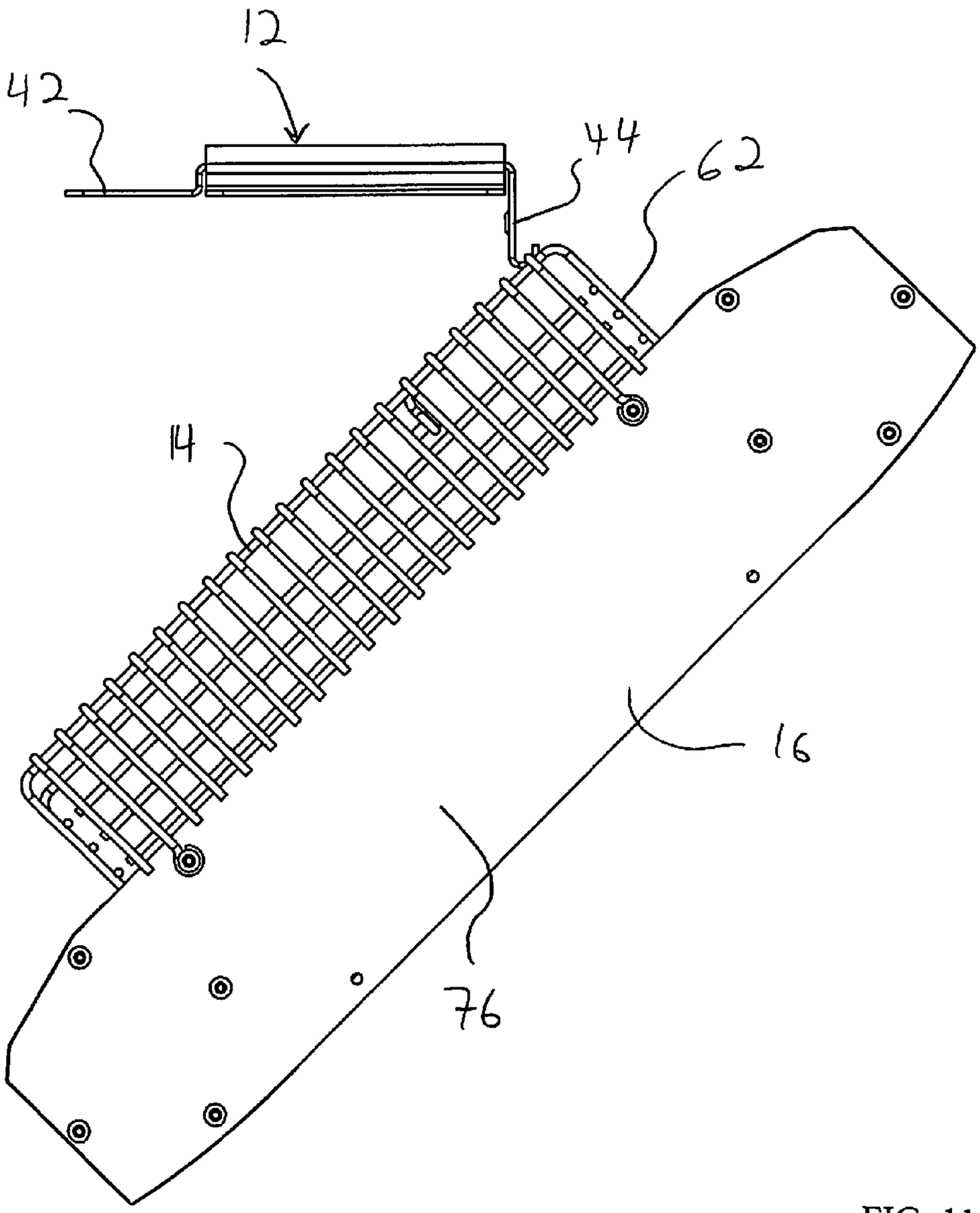



FIG. 11

# LIGHT FIXTURE SUPPORT SYSTEM

## FIELD OF THE INVENTION

This invention relates to lighting fixture and, more particularly, to supports for mounting lighting fixtures.

## BACKGROUND OF THE INVENTION

Industrial lighting applications such as roadway lighting, factory lighting, parking lot lighting, and commercial building lighting often require that the lighting fixtures utilized are mounted flush against a hard ceiling or other surface. In these types of settings the location of the light can often be isolated and/or particularly high in the air. This leads to difficulty in installing and mounting the fixture.

In recent years, the use of light-emitting diodes (LEDs) for various common lighting purposes has increased, and this trend has accelerated as advances have been made in LEDs and in LED arrays, often referred to as "LED modules." Indeed, lighting applications which previously had been served by fixtures using what are known as high-intensity discharge (HID) lamps are now beginning to be served by fixtures using LED-array-bearing modules.

Among the leaders in development of LED-array modules is Philips Lumileds Lighting Company of Irvine, Calif. Work continues in the field of LED module development, and also in the field of using LED modules for various lighting fixtures in various applications. It is the latter field to which this invention relates.

Floodlights using LED modules as light source for various applications present particularly challenging problems in fixture development, particularly when floodlight mounting locations and structures will vary. Among other things, placement of the electronic LED power units (LED drivers) for lighting fixtures using LED arrays can be particularly problematic. In some cases, keeping such electronic LED drivers in a water/air-tight location may not be difficult, but if mounting locations and structures vary, then location and protection of such components becomes difficult and adds development costs and potential problems. Lighting-fixture adaptability is an important goal for LED floodlights that are often presented and mounted in different ways.

Heat dissipation is another problem for LED floodlights and in fact all large industrial type lights. And, the goals of dealing with heat dissipation and protection of electronic LED drivers and/or other internal systems and wiring can often be conflicting, contrary goals.

## OBJECTS OF THE INVENTION

It is an object of the invention to provide a light fixture support assembly that overcomes some of the problems and shortcomings of the prior art, including those referred to above.

Another object of the invention is to provide a light fixture support assembly that allows easy mounting of a light fixture to a ceiling.

Another object of the invention is to provide a light fixture support assembly that is capable of supporting the light fixture during the assembly and installation process.

Another object of the invention is to provide a light fixture support assembly that allows for protection of the internal systems of the light fixture while still offering sufficient heat dissipation from the light fixture.



How these and other objects are accomplished will become apparent from the following descriptions and the drawings.

## SUMMARY OF THE INVENTION

The present invention is a light fixture support assembly. The inventive ceiling-mounted light-fixture support assembly includes a mounting bracket having upper and lower surfaces, a length, and a width between two width sides. The assembly also includes a fixture attachment member having a top with portions defining a top opening which has a width narrower than the width of the mounting bracket. The fixture attachment member further has a recessed portion defining a slideway which (a) is in lateral communication with the top opening, (b) has a width wider than the width of the mounting bracket, and (c) is spaced sufficiently lower than the opening-defining portions of the top to receive the two width sides of the mounting bracket. In use, the fixture attachment member can be positioned so that the mounting bracket is at least partially within the slideway and then repositioned so that the mounting bracket is within the top opening for light-fixture support.

In another embodiment of the present invention, the fixture attachment member includes a side wall around a perimeter of the fixture attachment member extending away from the support assembly opposite the top. A slideway opening in communication with the slideway is defined within the side wall. In preferred embodiments the slideway opening is the same width as the slideway.

In a further embodiment of the light fixture support assembly, at least part of the recessed portion of the fixture attachment member is in a overlapping relationship with the portion of the fixture attachment member defining the top opening. In highly preferred embodiments, the fixture attachment member is formed as a cage.

In yet another embodiment, the mounting bracket of the light fixture support assembly includes a hook. It is preferred that the hook extends away from the lower surface of the mounting bracket.

In a still further embodiment of the light fixture support assembly, the mounting bracket includes a side flange extending from each width side and offset from the lower surface of the mounting bracket. In more preferred embodiments, the mounting bracket further includes an end flange extending from a length side and offset from the bottom side of the mounting bracket whereby at least a portion of the end flange is in an overlapping relationship with the recessed portion of the fixture attachment member.

In other preferred embodiments, the light fixture support assembly includes the light fixture itself that is an LED floodlight fixture. The LED floodlight fixture includes a housing forming a substantially water/air-tight chamber, at least one electronic LED driver enclosed within the chamber, and an LED assembly secured with respect to the housing adjacent thereto in non-water/air-tight condition, the LED assembly having at least one LED-array module mounted on an LED heat sink.

The housing preferably includes substantially water/air-tight wire-access(es) for passage of wires between the LED assembly and the water/air-tight chamber.

The housing includes a first border structure forming a first border-portion of the chamber, the first border structure receiving wires from the at least one LED-array module and the LED heat sink being interlocked with the first border structure. The housing further includes a frame structure forming a frame-portion of the chamber secured to the first

border structure, the frame structure extending along the LED assembly. It is highly preferred that the border structure is a metal extrusion.

In some preferred embodiments, the first border structure has at least one bolt-receiving border-hole through the first border structure, such border-hole being isolated from the first border-portion of the chamber. The frame structure also has at least one bolt-receiving frame-hole through the frame structure, the frame-hole being isolated from the frame-portion of the chamber. Each such one or more frame-holes are aligned with a respective border-hole(s). A bolt passes through each aligned pair of bolt-receiving holes such that the border structures and the frame structure are bolted together while maintaining the water/air-tight condition of the chamber.

In some highly preferred embodiments, the housing includes a second border structure forming a second border-portion of the chamber, the LED heat sink being interlocked with the second border structure.

In certain highly preferred embodiments the LED assembly includes a plurality of LED-array modules each separately mounted on its corresponding LED heat sink, the LED heat sinks being interconnected to hold the LED-array modules in fixed relative positions. Each heat sink preferably includes a base with a back base-surface, an opposite base-surface, two base-ends and first and second base-sides, a female side-fin and a male side-fin, one along each of the opposite sides and each protruding from the opposite surface to terminate at a distal fin-edge. The female side-fin includes a flange hook positioned to engage the distal fin-edge of the male side-fin of an adjacent heat sink. At least one inner-fin projects from the opposite surface between the side-fins. One of the LED modules is against the back surface.

In some preferred embodiments, each heat sink includes a plurality of inner-fins protruding from the opposite base-surface. Each heat sink may also include first and second lateral supports protruding from the back base-surface, the lateral supports each having an inner portion and an outer portion, the inner portions of the first and second lateral supports having first and second opposed support-ledges, respectively, forming a heat-sink-passageway slidably supporting one of the LED-array modules against the back base-surface. The first and second supports of each heat sink are preferably in substantially planar alignment with the first and second side-fins, respectively. The flange hook is preferably at the distal fin-edge of the first side-fin.

It is highly preferred that each heat sink be a metal extrusion with the back base-surface of such heat sink being substantially flat to facilitate heat transfer from the LED-array module, which itself has a flat surface against the back-base surface.

Each heat sink also preferably includes a lateral recess at the first base-side and a lateral protrusion at the second base-side, the recesses and protrusions being positioned and configured for mating engagement of the protrusion of one heat sink with the recess of the adjacent heat sink.

In certain of the above preferred embodiments, the female and male side-fins are each a continuous wall extending along the first and second base-sides, respectively. It is further preferred that the inner-fins are also each a continuous wall extending along the base. The inner-fins can be substantially parallel to the side-fins.

In highly preferred embodiments, the LED floodlight fixture further includes an interlock of the housing to the LED assembly. The interlock has a slotted cavity extending along the housing and a cavity-engaging coupler which extends from the heat sink of the LED assembly and is received within the slotted cavity.

In some of such preferred embodiments, in each heat sink, at least one of the inner-fins is a middle-fin including a fin-end forming a mounting hole receiving a coupler. In some versions of such embodiments, the coupler has a coupler-head; and the interlock is a slotted cavity engaging the coupler-head within the slotted cavity. The slotted cavity preferably extends along the border structure and the coupler-head extends from the heat sink of the LED assembly.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of a preferred fixture support assembly in accordance with this invention.

FIG. **2** is top plan of the mounting bracket of the fixture support assembly of FIG. **1**.

FIG. **3** is side plan view of the mounting bracket of FIG. **2**.

FIG. **4** is top plan view of the fixture attachment member of the fixture support assembly of FIG. **1**.

FIG. **5** is a fragmentary view taken along the line I-I of FIG. **1** with the mounting bracket removed.

FIG. **6** is an enlarged fragmentary end-wise perspective view of two interconnected LED heat sinks of the LED assembly of the illustrated LED floodlight fixtures.

FIG. **7** is an enlarged fragmentary perspective view of one LED-array module LED and its related LED heat sink of the LED assembly of the illustrated fixture support assembly.

FIG. **8** is a fragmentary view taken along the line I-I of FIG. **1**.

FIG. **9** is an end plan view of the fixture support assembly of FIG. **1**.

FIG. **10** is a top plan view of the mounting bracket and fixture attachment member of FIG. **1**.

FIG. **11** is a side plan view of the fixture support assembly of FIG. **1** in the installation position.

## DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

FIGS. **1-11** illustrate preferred fixture support assembly **10** in accordance with this invention. Fixture support assembly **10** includes a mounting bracket **12** that can be mounted to a surface (not shown), preferably a ceiling, a fixture attachment member **14**, and an LED flood light **16**.

As shown best in FIGS. **2** and **3**, mounting bracket **12** includes an upper surface **18** and a lower surface **20**. The bracket **12** further includes opposite width sides **22**, **24** and opposite length sides **26**, **28**. In this preferred embodiment the bracket **12** also has opposite side flanges **30**, **32** extending from the width sides **22**, **24**. Each side flanges **30**, **32** is offset away from the lower surface **20** by a flange support **34**. The width dimension **36** of the bracket **12** is defined by the combined width of the bracket **12** and the side flanges **30**, **32**. The vertical dimension **38** of the bracket **12** includes the height **40** of the width flanges **30**, **32** along with the offset of the flange supports **34** and bracket **12** itself. The bracket **12** also includes an end flange **42** extending from one length side **26**. The end flange **42** is also offset by a flange support **34**. The length dimension **44** of the bracket is defined by the combined length of the bracket **12** and the end flange **42**.

In this preferred embodiment the bracket also includes a hook **44**. The hook extends away from the lower surface **20** of the bracket **12** at the length side **28** opposite the end flange **42**.

Finally, the bracket **12** can include an aperture **45** that will allow passage of wires (not shown) into the LED floodlight **16**.

The fixture attachment member **14** works in conjunction with the bracket **12** to support the LED floodlight **16**. Referring now to FIGS. **4**, **5** and **9**, the fixture attachment member **14** includes a top **46** having portions **48** that define a top opening **50**. The top opening **50** has a width dimension **52** that is less than the width dimension **36** of the bracket **12**. The top **46** also includes a recessed portion **54** that defines a slideway **56**. The recessed portion **54** is in a overlapping relationship with the portions **48** of the top **46** that define the top opening **50**. The slideway **56** is dimensioned and located to meet three criteria: 1) it is in lateral communication with the top opening **50**, 2) the width dimension **58** of the slideway **56** is wider than the width dimension **36** of the bracket **12**, and 3) that it is spaced sufficiently lower than the opening-defining portions **46** of the top to receive the side flanges **30**, **32** of the mounting bracket (i.e., the vertical dimension **60** of the slideway **56** must be greater than the height **40** of the flanges **30**, **32**). The recessed portion **54** also defines a hook opening **61**.

The fixture attachment member **14** further includes a side wall **62** around the perimeter of the fixture attachment member **14**. As can be seen in this preferred embodiment, the fixture attachment member **14** can be formed of a metal cage (although it could be of a solid design) that includes gaps at the corners of the shape; however, the concept of around the perimeter as used in this invention includes these gaps. This side wall **62** defines a slideway opening **63** that is dimensioned and disposed to match up with the slideway **56** formed in the recessed portion **54** of the fixture attachment member **14**.

The fixture attachment member **14** is attached to the LED floodlight **16** along the side wall **62** opposite the top **46** of the fixture attachment member **14**. Referring now to FIGS. **1** and **5-7** the LED floodlight **16** includes a housing **64**, an LED assembly **66**, and an LED driver **68**.

The housing **64** is formed of two border structures **70**, **72** which each form a substantially air/water-tight chamber **74**. The LED driver **68** is positioned within one of the chambers **74**. The border structures **70**, **72** are interconnected by housing supports **76**, **78** which together form the housing **64** and forms an interior **80** of the housing **64**. The interior side of the border structures **70**, **72** includes a slotted cavity **82** for attaching the LED assembly **66**. The border structure **70** with the LED driver **68** also includes and air/water-tight wire-access **84** for receiving wires **86** from the LED assembly **66**.

LED assembly **66** includes a plurality of LED-array modules **88** each separately mounted on its corresponding LED heat sink **90**, such LED heat sinks **90** being interconnected to hold LED-array modules **88** in fixed relative positions. Each heat sink **90** includes: a base **92** with a back base-surface **94**, an opposite base-surface **96**, two base-ends **98** and first and second base-sides **100** and **102**; a plurality of inner-fins **104** protruding from opposite base-surface **96**; first and second side-fins **106** and **108** protruding from opposite base-surface **96** and terminating at distal fin-edges **110** and **112**, first side-fin **106** including a flange hook **114** positioned to engage distal fin-edge **261** of second side-fin **108** of adjacent heat sink **90**; and first and second lateral supports **116** and **118** protruding from back base-surface **94**, lateral supports **116** and **118** each having inner portions **120** and **122**, respectively, and outer portion **124** and **126**, respectively. Inner portions **120** and **122** of first and second lateral supports **116** and **118** have first and second opposed support-ledges **128** and **130**, respectively, that form a heat-sink-passageway **132** which slidably supports an LED-array module **88** against back base-surface **94**. First and second supports **116** and **118** of each heat sink **90** are in substantially planar alignment with first and second side-fins **106** and **108**, respectively. The flange hook **114** is at distal fin-edge **251** of first side-fin **106**.

Each heat sink **90** is a metal (preferably aluminum) extrusion with back base-surface **94** of heat sink **90** being substantially flat to facilitate heat transfer from LED-array module **88**, which itself has a flat surface **134** against back-base surface **94**. Each heat sink **90** also includes a lateral recess **136** at first base-side **100** and a lateral protrusion **138** at second base-side **102**, recesses **136** and protrusions **138** being positioned and configured for mating engagement of protrusion **138** of one heat sink **90** with recess **136** of adjacent heat sink **90**.

Each heat sink **90** inner-fins **104** include two middle-fins **140** each of which includes a fin-end **142** forming a mounting hole **144**. A coupler **146** in the form of screw is engaged in mounting hole **144**, and extends from heat sink **90** to terminate in a coupler-head **148**. Housing **64** has a slotted cavity **82** which extends along, and is integrally formed with, each of border structures **70**, **72** and forms the interlock by receiving and engaging coupler-heads **148** therein.

Referring now to FIGS. **1** and **8-11**, the use of the fixture support assembly **10** is shown. The fixture attachment member **14** and LED floodlight **16** are positioned in the slideway **56** so that the side flanges **30**, **32** come in contact with the recessed portion **54** of the fixture attachment member **16**. The fixture attachment member **14** and floodlight **16** are then repositioned so that the side flanges **30**, **32** are positioned under the portions **48** of the top **46** that define the top opening **50** and the mounting bracket **12** is within the top opening **50**. When released by the installer the interference between the side flanges **30**, **32** and the top **46** hold the fixture attachment member **14** and floodlight **16** in place vertically. Furthermore, the end flange **42** is in contact with the recessed portion **54** which serves to hold the assembly in place. As shown in FIG. **11** during installation the hook **44** can serve to support the fixture attachment member **14** and floodlight **16** during installation by attaching to the cage form of the fixture attachment member **14**.

While the principles of the invention have been shown and described in connection with specific embodiments, it is to be understood that such embodiments are by way of example and are not limiting.

The invention claimed is:

**1**. A ceiling-mounted light-fixture support assembly comprising:

a mounting bracket having upper and lower surfaces, a length, and a width between two width sides; and

a fixture attachment member having a top with portions defining a top opening which has a width narrower than the width of the mounting bracket, the fixture attachment member further having a recessed portion defining a slideway which (a) is in lateral communication with the top opening, (b) has a width wider than the width of the mounting bracket, and (c) is spaced sufficiently lower than the opening-defining portions of the top to receive the two width sides of the mounting bracket,

whereby the fixture attachment member can be positioned so that the mounting bracket is initially at least partially within the slideway and then subsequently repositioned so that the mounting bracket is mounted within the top opening for light-fixture support.

**2**. The light fixture support assembly of claim **1** wherein the fixture attachment member includes a side wall around a perimeter of the fixture attachment member extending away

from the support assembly opposite the top and wherein a slideway opening in communication with the slideway is defined within the side wall.

**3**. The light fixture support assembly of claim **2** wherein the slideway opening is the same width as the slideway.

**4**. The light fixture support assembly of claim **2** wherein at least part of the recessed portion of the fixture attachment member is in a overlapping relationship with the portion of the fixture attachment member defining the top opening.

**5**. The light fixture support assembly of claim **4** wherein the fixture attachment member is formed as a cage.

**6**. The light fixture support assembly of claim **5** wherein the mounting bracket includes a hook.

**7**. The light fixture support assembly of claim **6** wherein the hook extends away from the lower surface of the mounting bracket.

**8**. The light fixture support assembly of claim **5** wherein the mounting bracket includes a side flange extending from each width side and offset from the lower surface of the mounting bracket wherein the width of the mounting bracket is the width between ends of the side flanges opposite the mounting bracket.

**9**. The light fixture support assembly of claim **8** wherein the mounting bracket further includes an end flange extending from a length side and offset from the bottom side of the mounting bracket whereby at least a portion of the end flange is in an overlapping relationship with the recessed portion of the fixture attachment member.

**10**. The light fixture support assembly of claim **5** further including an LED floodlight fixture attached to the fixture attachment member, the floodlight including:

a housing forming a substantially water/air-tight chamber;

at least one electronic LED driver enclosed within the chamber; and

an LED assembly secured with respect to the housing adjacent thereto in non-water/air-tight condition, the LED assembly having at least one LED-array module mounted on an LED heat sink;

whereby the fixture attachment member is attached to the floodlight at least partially enclosing the at least one LED assembly.

**11**. The fixture support assembly of claim **10** wherein the floodlight further includes an interlock of the housing to the LED assembly, the interlock having:

a slotted cavity extending along the housing; and

a cavity-engaging coupler which extends from the heat sink of the LED assembly and is received within the slotted cavity.

**12**. The fixture support assembly of claim **10** wherein the LED assembly includes a plurality of LED modules separately mounted on individual interconnected heat sinks, each heat sink having:

a base with a back surface, an opposite surface, two base-ends and two opposite sides, one of the LED modules being against the back surface;

a female side-fin and a male side-fin, one along each of the opposite sides and each protruding from the opposite surface to terminate at a distal fin-edge, the female side-fin including a flange hook positioned to engage the distal fin-edge of the male side-fin of an adjacent heat sink; and

at least one inner-fin protruding from the opposite surface between the side-fins.

**13**. The fixture support assembly of claim **10** wherein the housing includes substantially water/air-tight wire-access(s) receiving wires from the LED assembly into the chamber.

**14**. The fixture support assembly of claim **10** wherein the housing includes a first border structure forming a first border-portion of the chamber, the first border structure receiving wires from the at least one LED-array module and the LED heat sink being interlocked with the first border structure.

**15**. The fixture support assembly of claim **14** wherein the housing includes a second border structure forming a second border-portion of the chamber, the LED heat sink being interlocked with the second border structure.

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